

Listing of the Claims

Please amend claims 1, 3-4 and 9-10 as indicated below. This listing of claims replaces all prior versions.

1. (Currently Amended) A method for ~~subtracting~~ subtracting quantization noise from a pulse code modulated PCM signal being segmented into frames, comprising the steps of:
- calculating for each frame of said PCM signal a constant quantization noise level B_q according to the following equation:

$$B_q = \sqrt{\sum_{n=0}^{W-1} \frac{\{(s_{\min}^*[n] - s_{\max}^*[n]) \cdot w[n]\}^2}{12}}$$

wherein

n: indicates a specific sample of the PCM signal; $S_{\min}^{*[n]}$: represents the minimum quantization noise level for a specific sample value $s^*[n]$ of said PCM signal; $S_{\max}^{*[n]}$: presents the maximum quantization noise level for the specific sample value $s^*[n]$ of the PCM signal;

$w[n]$: represents a window-function; and

W: represents the number of samples per window; and

~~subtracting~~ subtracting the quantization noise as represented by said quantization noise level B_q from said PCM signal.

2. (Original) The method according to claim 1, characterized in that the minimum quantization level S_{\min}^* as well as the maximum quantization level S_{\max}^* are known.

3. (Currently Amended) The method according to claim 1, characterized in that the minimum quantization level S_{\min}^* and the maximum quantization level S_{\max}^* are predicted according to the following equations:

$$S_{\min}^* = i[n] - (i[n] - i_{\min}[n]) / 2$$

$$S_{\max}^* = i[n] + (i_{\max}[n] - i[n]) / 2$$

wherein

i : represents one out of a plurality of possible representation levels predefined due to the specific PCM quantization method applied to an original signal;

$i[n]$: represents that predefined representation level which corresponds to the sample value $s^*[n]$ for a specific n ;

$i_{\min}[n]$: represents that representation level which is ~~is--startet~~ started from $i[n]$ --the next smaller non-zero representation level for which $u[n]=1$;

$i_{\max}[n]$: represents that representation level which is ~~is--startet~~ started from $i[n]$ --the next bigger non-zero representation level for which $u[n]=1$;

with the usage array $u[i]$ being defined to:

$$u(i) = \min \left(1, \sum_{n=0}^{L-1} \begin{cases} 0, & s^*[n] \neq i \\ 1, & \text{otherwise} \end{cases} \right), -2^{N-1} \leq i < 2^{N-1}$$

wherein

L : represents the number samples of the whole PCM-signal; and

N : represents the number of bits used for quantizing an original sample value by using PCM to generate the PCM sample values $s^*[n]$.

4. (Currently Amended) The method according to claim 1, characterized in that the ~~subtracting~~ subtracting of the quantization noise represented by said quantization noise level B_q from the PCM-signal is carried out in the frequency domain according to the following steps:

computing the spectrum $S^*[k]$ of the PCM signal $s^*[n]$ and forming the magnitude $|S^*[k]|$ thereof;

computing a signal-to-noise ratio $SNR[k]$ of said spectrum $S^*[k]$ according to:
 $SNR[k] = |S^*[k]|/B_q$;

calculating from said signal-to-noise ratio $SNR[k]$ a filter magnitude $F[k]$ according to a predefined filter algorithm based on at least one filter update parameter;

calculating an output spectrum $S^b[k]$ at least substantially free of said quantization noise by multiplying both the real part $R\{S^*[k]\}$ and the imaginary part $I\{S^*[k]\}$ of the spectrum $S^*[k]$ with said filter magnitude $F[k]$; and

transforming the output spectrum $S^b[k]$ back into a signal $s^b[n]$ in the time domain.

5. (Original) The method according to claim 4, characterized in that the filter update parameter and thus the filter magnitude $F[k]$ are adjusted such that the quantization noise in the remaining output spectrum $S^b[k]$ is as low as possible.

6. (Original) The method according to claim 4, characterized in that it further comprises the steps of:

weighting the frames of the input PCM signal with a first window $w1[n]$ and calculating the spectrum $S^*[k]$ from said weighted signal;

generating a weighted output signal $s_w^b[n]$ by weighting the signal $s^b[n]$ received after the re-transformation with a second window $W2[n]$; and

calculating a final output signal $S_w^b[n]$ for a current frame of the PCM-signal from said weighted output signal $s_w^b[n]$ such that the transition between two successive output frames and is smoothed.

7. (Original) The method according to claim 4, characterized in that the computation of the spectrum $S^*[k]$ of the PCM signal is done by using a Fast Fourier Transformation FFT; and

the re-transforming the output spectrum $S^b[k]$ back into a time domain signal $s^b[n]$ is done by using an inverse FFT.

8. (Original) The method according to claim 6, characterized in that the first and the second window $w1$ and $w2$ are identical.

9. (Currently Amended) A quantization noise ~~subtracting~~ subtracting unit for ~~subtracting~~ subtracting quantization noise from a pulse code modulated PCM signal being segmented into frames, comprising:

a quantization noise level calculating unit (100) for calculating for each frame of said PCM signal a constant quantization noise level B_q according to the following equation:

$$B_q = \sqrt{\sum_{n=0}^{W-1} \frac{\{(s_{\min}^*[n] - s_{\max}^*[n]) \cdot w[n]\}^2}{12}}$$

wherein

n: indicates a specific sample of the PCM signal;

S*_{min}[n]: represents the minimum quantization noise level for a specific sample value s*[n] of said PCM signal;

S*_{max}[n]: represents the maximum quantization noise level for the specific sample value s*[n] of the PCM signal;

w[n]: represents a window-function; and

W: represents the number of samples per window; and

a background noise ~~subtracting~~ subtracting unit (200) for ~~subtracting~~ subtracting the quantization noise as represented by said quantization noise level B_q from said PCM signal.

10. (Currently Amended) The noise ~~subtracting~~ subtracting unit according to claim 9, characterized in that it is located at a decoder's side.